(AB)

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TI Transparent heat-reflecting layers of tin oxide on glass
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AB Light green SnO_2 glass coatings contg. 2.5-3.5% F with 70-87% transmission in the visible region and 70-80% reflection in the 5-12 .mu. region are prepd. by spraying a mixt. of 100 g $MeSnCl_2$, 100 mL distd. water, and 4-5 mL HF on a hot glass surface (640-650.degree.). A similar layer contg. 1% Sb instead of F was prepd. by treating a 580.degree. glass surface with a 1:0.8 vapor mixt. of $SnCl_2$ and $SbCl_3$.
ST tin oxide glass coating; glass coating heat reflecting; antimony tin oxide glass coating; fluoride tin oxide glass coating
IT Glass, oxide
RL: USES (Uses)
(coatings on, tin oxide, transparent heat-reflecting)
IT Coating materials
(heat-reflective, transparent, antimony tin oxide and tin oxyfluoride, on glass)
IT 18282-10-5
RL: USES (Uses)
(coatings, contg. antimony and fluoride, transparent heat-reflecting, on glass)
IT 7772-99-8, reactions
RL: RCT (Reactant)
(reaction of, with hydrogen fluoride and antimony chloride, in oxide coating on glass)
IT 7664-39-3, reactions 10025-91-9
RL: RCT (Reactant)
(reaction of, with tin chloride, in oxide coating on glass)
IT 7440-36-0, uses and miscellaneous 16984-48-8, uses and miscellaneous
RL: USES (Uses)
(tin oxide coatings contg., transparent heat-reflecting, on glass)

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Transparent heat-reflecting layers of tin oxide on glass

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7664-39-3 (FH), reactions; 10025-91-9 (Cl3Sb): (reaction of, with tin chloride, in oxide coating on glass)
7772-99-8 (Cl2Sn), reactions: (reaction of, with hydrogen fluoride and antimony chloride, in oxide coating on glass)
18282-10-5 (O2Sn): (coatings, contg. antimony and fluoride, transparent heat-reflecting, on glass)
-Coating materials-, heat-reflective, transparent: (antimony tin oxide and tin oxyfluoride, on glass)
-Glass-, oxide: (coatings on, tin oxide, transparent heat-reflecting)
Mots-Clés compl. : tin oxide glass coating; glass coating heat reflecting; antimony tin oxide glass coating; fluoride tin oxide glass coating

FURTHER TRANSLATION

TRANSLATION FROM CZECH of Ref: A of record; IDS dated 02/14/08

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(54) Process for producing transparent heat-reflective layers of doped tin dioxide on glass

The invention solves the problem of achieving maximum infrared reflectivity of thin transparent heat-reflective layers on glass.

The surface of heated glass is brought into contact with a medium containing at least one decomposable organic or inorganic compound of tin and at least one decomposable compound of an electrically active mixture derived from a group comprising fluorine and antimony, for a period which is sufficient for the formation of a tin dioxide layer, the precise concentration of the mixture at a temperature of less than, or equal to, 570°C being chosen such as to be in the range from 5 to 10% by weight depending on the concrete temperature of the heated glass.

EXHIBIT B

The invention relates to a process for producing transparent heat-reflective layers of doped tin dioxide on glass, in which a solution of a mixture of at least one decomposable organic or inorganic compound and of at least one heat-decomposable compound of an electrically active mixture derived from a group comprising fluorine and antimony is applied to the surface of the heated glass.

Layers of semiconducting tin dioxide with greatly enhanced electron conductivity due to doping using suitable electrically active mixtures are noted by high reflectivity in the infrared part of the spectrum and at the same time by low absorption in the visible region.

Because of these properties, they are advantageously employed as so-called heat-reflective layers. When applied to the glass surface at a thickness of the order of some hundreds of nanometers, they reflect as much as 80% of impinging heat radiation from sources with temperatures ranging from 20 to 1000°C.

They have many uses: on constructional sheet glass they improve the heat-insulating properties of windows and other glass areas of buildings, on glass tubes they enhance the heat efficiency of tubular solar collectors, on glass bulbs they improve the candle power of sodium-vapour lamps, and the like.

Czechoslovak patent 220,175 describes the process of producing transparent heat-reflective layers of tin dioxide on glass. The glass is heated to a temperature above 570°C and its surface is brought into contact with a liquid or gaseous phase of a medium containing at least one decomposable organic or inorganic compound of tin and at least one decomposable doping compound of an electrically active mixture derived from a group comprising fluorine and antimony at a concentration from 0.5 to 5% by weight.

This range of fluorine or antimony concentration ensures maximum heat reflectivity at temperatures greater than 570°C only, for example 640 to 650°C. However, float glass between leaving the float bath and entering the cooling oven can have a temperature lower than 570°C, and at this temperature and at a dopant concentration of 0.5 to 5% the applied layer has a lower reflectivity in the region from 5 to 12 micrometers and reaches a maximum value of 50%.

The above drawbacks are overcome or substantially reduced by the process according to the invention in which a solution containing 5 to 10% by weight of an electrically active mixture is applied to glass heated to a temperature ranging from 350 to 570°C.

The process according to the invention, when applied to float glass, achieves optimum reflectivity while utilizing the heat borne by the glass from its manufacturing process. When used inside a tube or an electric bulb, it is sufficient for the glass to be heated to a lower temperature than hitherto, leading to a saving of energy with only slightly increased consumption of material.

The process is elucidated in the examples below:

Example 1

A solution, produced by mixing 100 g of tin dimethyl dichloride $(CH_3)_2SnCl_2$, 100 ml of distilled water H_2O and 9.4 ml of hydrofluoric acid HF is sprayed via a special compressed-air nozzle onto the inside surface of a tube, 50 mm in diameter, made from borosilicate glass and heated to 570°C.

A homogeneous layer of tin dioxide SnO_2 containing 6% of fluorine F forms on the glass; it has a uniform light green colour in reflection, a transmission in the visible part of the spectrum of 75 to 85% and a reflectivity in the region from 5 to 12 μm in the range of 65-75%.

Example 2

A solution, produced by mixing 100 g of tin dimethyl dichloride $(CH_3)_2SnCl_2$ and tin monomethyl trichloride CH_3SnCl_3, 100 ml of distilled water H_2O and 9.9 g of ammonium fluoride NH_4F is applied onto a strip of float glass, 5 mm thick, at a stage between the float bath and the cooling oven, when the glass has an approx. temperature of 560°C.

A homogeneous layer of tin dioxide SnO_2 containing 7% of fluorine F forms on the glass; it has a uniform light green colour in reflection, a transmission in the visible part of the spectrum of 68 to 75% and a reflectivity in the region from 5 to 12 μm in the range of 65-75%.

Example 3

A solution, produced by mixing 80 ml of stannic chloride $SnCl_4$, 160 ml of ethyl alcohol C_2H_5OH, 15 ml of hydrochloric acid HCl and 9 g of antimony trichloride $SbCl_3$ is sprayed by means of a spray gun onto a sheet of Fourcault float glass, 4 mm thick, heated to 560°C.

A homogeneous layer of tin dioxide SnO_2 containing 6% of antimony Sb forms on the glass; it has a uniform light blue colour in reflection, a transmission in the visible part of the spectrum of 63 to 70% and a reflectivity in the region from 5 to 12 μm in the range of 60-70%.

CLAIM

A process for producing transparent heat-reflective layers of doped tin dioxide on glass, in which the surface of the heated glass is brought into contact with a medium containing at least one decomposable organic or inorganic compound of tin and at least one decomposable compound of an electrically active mixture derived from a group comprising fluorine and antimony, characterized in that the medium is brought into contact with glass heated to a temperature from 350 to 570°C and the concentration of the electrically active mixture is chosen such as to be in the range from 5 to 10% by weight depending on the concrete temperature of the heated glass.